

SECTION 1

Introduction

1.1 Overview

The King County Department of Natural Resources and Parks, and its predecessor METRO (Municipality of Metropolitan King County), has a long history of water quality monitoring and involvement with water quality improvements. As part of an intergovernmental effort to maintain and improve Puget Sound's water quality, the King County Wastewater Treatment Division provides regional sewage collection, treatment, and disposal systems which discharge wastewater to the Central Puget Sound Basin and waters flowing into the Sound. King County's Marine and Sediment Assessment Group supports a comprehensive, long-term marine monitoring program that assesses water quality in the Central Puget Sound Basin on behalf of and in coordination with the King County Wastewater Treatment Division.

The marine monitoring program is also part of an intergovernmental monitoring effort, the Puget Sound Ambient Monitoring Program, centering on Puget Sound marine waters with the County's program focusing on water quality mainly within King County boundaries. The Washington Department of Ecology (water and sediment quality), Washington Department of Fish & Wildlife (contaminants in fish tissues), and Washington Department of Health (shellfish growing areas and contaminants) also monitor water quality in Puget Sound. These agencies have stations throughout the Sound, including sites within King County. The main distinction among these agency monitoring programs is that the County has more stations within a concentrated area that are near wastewater treatment plant discharges. Although the other agencies have monitoring stations within King County, these stations do not overlap with the County's stations which allows a greater proportion of Puget Sound to be monitored.

The objectives of the King County marine monitoring program are to provide an understanding of water quality within King County and to assess water quality near the County's wastewater plant outfalls to confirm that discharges are not adversely affecting water quality. The County maintains a long-term dataset, with over 30 years of data collection at some sites. This dataset provides insight to natural variations and a basis against which water quality conditions near outfalls can be measured.

King County plans to build a new regional wastewater treatment plant in northern King County or southern Snohomish County. The treatment plant will discharge secondary treated effluent through a marine outfall also located in northern King County or in southern Snohomish County. An extensive marine monitoring program (the Marine Outfall Siting Study) was initiated in October 1998 to support siting of a suitable location for the marine outfall.

This report summarizes results of King County's National Pollutant Discharge Elimination System (NPDES) and ambient marine monitoring programs for 2001. In addition, Marine Outfall Siting Study (MOSS) water quality sampling results for 2001 are summarized. The report is intended to provide an overview of the sites monitored, parameters measured, matrices (e.g., water, sediment, and tissue) sampled, and a summary of analytical results.

1.2 Sampling Area Characteristics

Puget Sound is a fjord-like estuary that extends approximately 230 kilometers (km) in a north-south direction and is bordered by the Olympic mountains to the west and the Cascade mountain range to the east. The Sound consists of four major basins, including the Main (Admiralty Inlet and the Central Basin), Whidbey, Southern, and Hood Canal Basins. The average depth in Puget Sound is 106 meters (m). The Main Basin, with depths greater than 280 m, is shielded at the main entrance to the Sound by the Admiralty Inlet Sill which impedes the free exchange of deep waters. However, the Sound has near-oceanic salinity throughout the year, and is supplemented with cold, nutrient-rich, low-oxygenated deep water upwelled off the Washington coast during the late summer months. Water from the Pacific Ocean enters the Sound through Admiralty Inlet and Deception Pass. Puget Sound contains approximately 168 billion cubic meters of water, with an average tidal exchange of 3.7 to 4.3 m and an average water volume exchange of 8 billion cubic meters with each tidal cycle (King County, 1994). A mixed semi-diurnal tide, which is characterized by two unequal high tides and two unequal low tides occurring each day, dominates the tidal pattern within Puget Sound. These characteristics are conducive to maintaining overall favorable water quality conditions in Puget Sound.

Many complex factors influence water quality in Puget Sound, including water currents, physical, biological, chemical aspects, and human activities. Offshore water samples consistently indicate good water quality. However, nearshore sediments tend to accumulate contaminants from industrial and urban processes. Sediment carried in runoff from land plays a much greater role in Puget Sound's water quality than in most oceanic areas. Being surrounded by hills, lakes, and rivers in an urbanized area with substantial rainfall gives the Sound a multitude of complex sediment sources. The predominant sediment sources are from rivers and bluff erosion. The twelve largest rivers entering Puget Sound contribute approximately 1.8 million cubic meters of sediment annually. Their suspended load is highest during winter and early spring when heavy seasonal precipitation from storms erodes soil from the surrounding lowlands. Sediment sampling generally shows the highest levels of organic compounds in the nearshore areas of Elliott Bay, where urban runoff from storm drains, industrial sources, and nonpoint sources is the greatest.

Puget Sound waters were affected by recent El Niño wet-weather conditions in 1994-5 and again in 1997-1998. The most recent El Niño event was followed almost

immediately by a weak to moderate La Niña event that lasted through 1999. This resulted in a drier than normal year for 2000, however, essentially normal rainfall conditions were re-established in 2001.

1.3 Sampling Area

King County's NPDES and ambient marine water study region is located within the Central Basin extending southwest to Tramp Harbor and southeast to Normandy Park, west to Vashon Island, and north to Richmond Beach (Figure 1-1). Elliott Bay, a large urban embayment, is also located within the County's monitoring area.

The MOSS sampling region extends north from the southern portion of Admiralty Inlet to the west, around the southern tip of Whidbey Island to Possession Sound in the east. The southern boundary of the study area is the northern portion of Colvos Passage across to the main channel (see Figure 1-1). The MOSS locale includes areas in both King and Snohomish Counties.

1.4 Wastewater Collection and Treatment

Wastewater from homes, businesses, and industries within King County and southern Snohomish County is transported through pipelines that belong to local sewer agencies and then through King County's system of much larger pipelines (interceptors) to the County-operated treatment plants. At the plants, solids are separated from liquids. The liquids are then treated, disinfected, and discharged into Puget Sound marine waters. The solids are treated and the resulting rich organic material, known as biosolids, are recycled and used to enrich agricultural and forest soils.

The County provides wastewater treatment and disposal services to cities and local sewer and/or water districts with more than 200 million gallons of wastewater transported and treated each day. To accomplish this, King County currently operates and maintains three wastewater treatment plants, two combined sewer overflow (CSO) treatment plants, 37 pump stations, and approximately 391 kilometers of pipelines (Figure 1-2). The West Point Treatment Plant (TP), South Plant (formerly known as the Renton and East Division Reclamation Treatment Plant), and Vashon TP provide secondary wastewater treatment. The West Point TP also functions as a CSO treatment facility during rain-induced high flows between 300 and 440 million gallons per day (MGD). These incoming high flows to the plant receive primary treatment and are then blended with secondary-treated wastewater, which is awaiting discharge to the outfall. This blended effluent continues to meet all permit standards for secondary treatment. The Alki and Carkeek CSO Treatment Plants store combined wastewater and stormwater flow and later pump it to the West Point TP or provide the equivalent of primary treatment and disinfection before discharging it to Puget Sound.

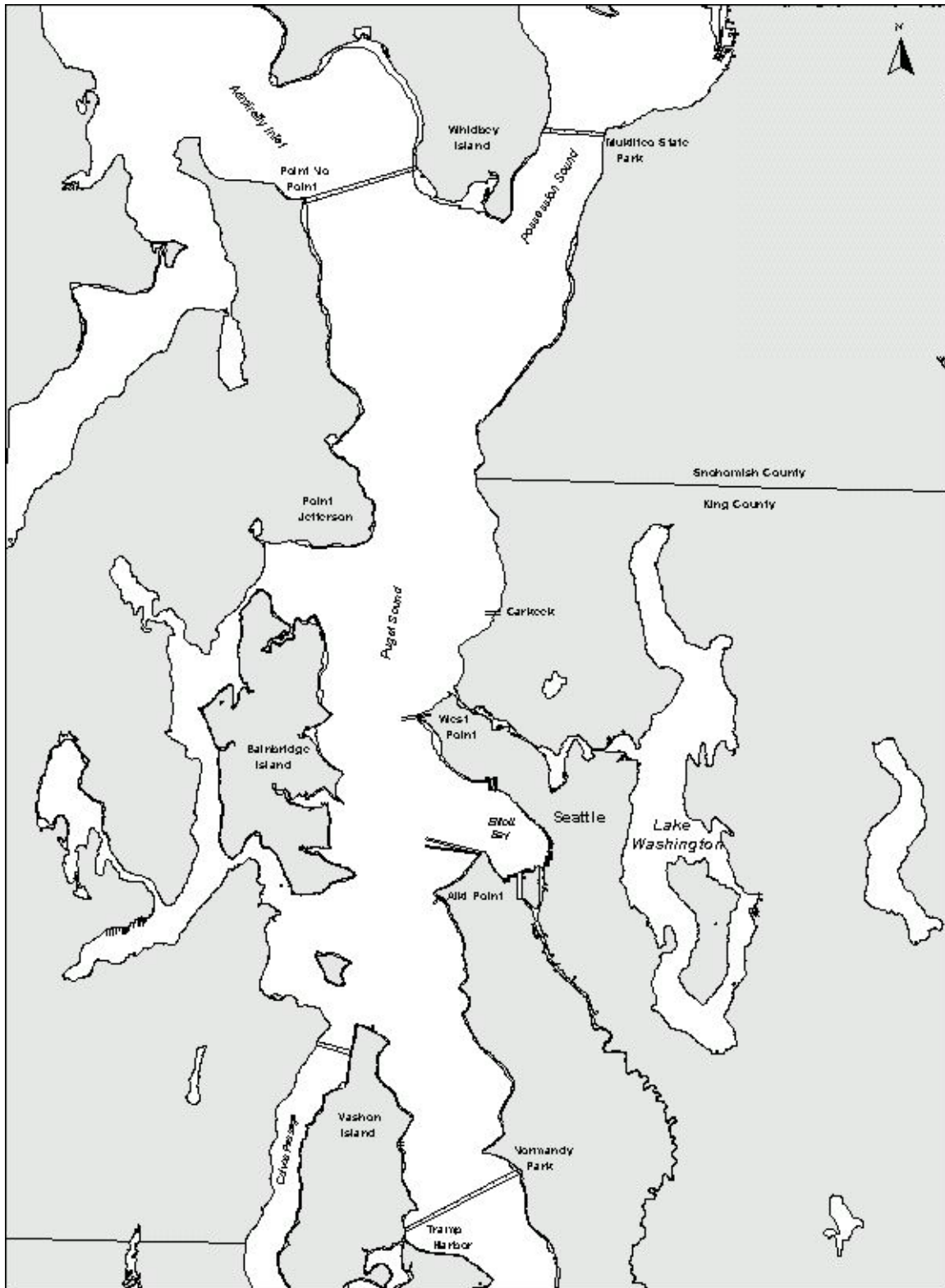


Figure 1-1. King County Sampling Area in 2001

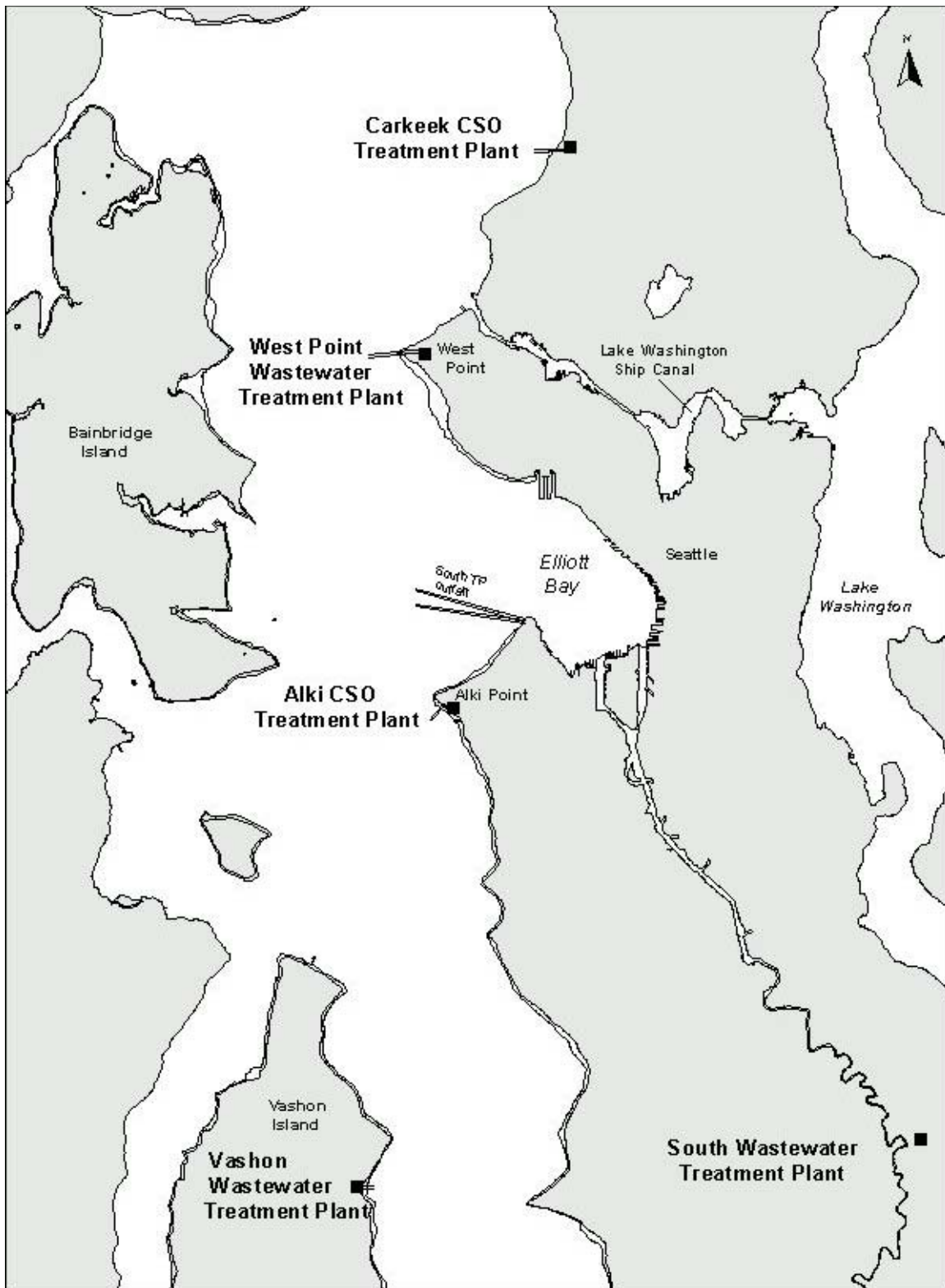


Figure 1-2. King County Wastewater Treatment Plant Locations

The West Point TP discharges the largest volume of effluent of the three secondary facilities. In 2001, the average daily discharge rates were 118.4, 69.5, and 0.10 MGD for the West Point, South, and Vashon TPs, respectively. Over the last ten years, wastewater discharge volumes have slightly increased at the two main treatment plants (West Point and South TPs) due to increased population growth within the County's service area (Figure 1-3). The slight decrease shown in 2000 and 2001 corresponds to low rainfall amounts, particularly for 2000 which had the lowest recorded rainfall amount (28.7 inches) since 1985. Discharges peak during times with high rainfall, with November and December having the highest average monthly discharge rates (see Section 3.1 for 2001 rainfall patterns).

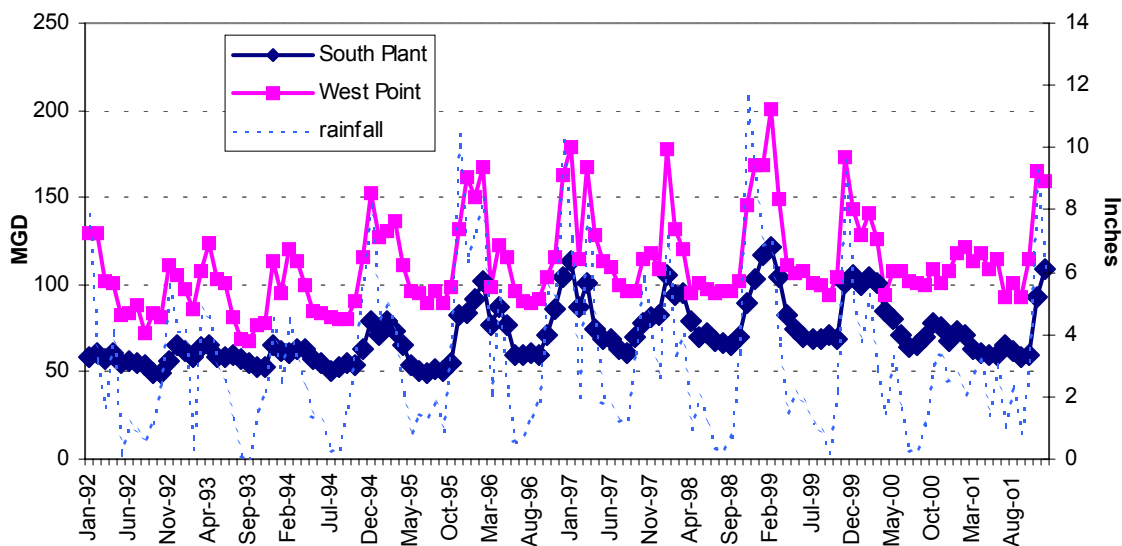


Figure 1-3. Monthly Flow from South and West Point TPs (MGD) and Monthly Rainfall (In.)

During 2001, the Alki CSO TP had a total of four discharge events, two in November and two in December. The average volume discharged per event was 11.4 MG. The Carkeek CSO TP had a total of five discharge events in 2001, one in August, three in November and one in December. The average discharge volume per event was 2.7 MG.

King County took over operation of the Vashon Wastewater TP in November 1999. The plant discharges effluent through a 1300 foot outfall pipe located on the east side of Vashon Island south of Point Beals. The County is currently in the process of upgrading the existing facility to handle greater peak wastewater flows. It is anticipated that the new treatment facilities, including a longer outfall pipe, will be constructed adjacent to the existing plant and will be operational by 2006.

The wastewater and CSO treatment plants discharge effluent directly into Puget Sound marine waters. The Clean Water Act states that all wastewater collection and treatment facilities that discharge effluent into surface waters are required to have a NPDES permit. In Washington, the Washington State Department of Ecology (Ecology) administers this program by delegation from the U.S. Environmental Protection Agency. NPDES permits set limits on the quality of wastewater that is discharged at each facility. The current NPDES permit for the West Point, Carkeek, and Alki TPs expired in 2000 but has been administratively extended until the new permit is re-issued. The current South Plant NPDES permit expired in mid 2002 and has also been administratively extended until the permit is re-issued. The current Vashon TP NPDES permit was issued in 2002.